upwards, and draw in water to lubricate its gills, and reject it when it has served the purposes of respiration. The water at Mobile is usually fresh, but sometimes brackish. Sir Charles examined lately the Woolwich beds with Mr. Morris, and they verified Mr. De la Condamine's observations, observing there several dozen specimens of the Cyrena tellinella in an erect position. From this circumstance the Lecturer infers, that a body of fresh or river water had been maintained permanently on that spot during the Eocene period, and the presence of rolled oysters in the associated pebbly layers, with other marine shells, mixed with species of Melanopsis, Melania, Cerithium and Neritina demonstrate that the sea occasionally invaded the same area. To an overflow of the pebbly sand in which the Cyrenæ lived by salt water, may probably be attributed the poisoning of the mollusks which left their shells uninjured on the spot where they had lived.

The stratum called "the shell-bed," which contains at Greenwich, Woolwich, Upnor near Rochester, and other places, a great mass of fresh water, brackish-water and marine shells, especially oysters, is observed everywhere to underlie the great pebble-bed. Its mode of occurrence implies the entrance of one or more rivers into the Eocene sea in this region. Other rivers draining adjoining lands are indicated by a similar assemblage of fluvio-marine fossils near Guildford and at Newhaven in Sussex. The vicinity of land to the South and West of Woolwich is shown by the occurrence at New Cross, Camberwell, and Chelsea of Paludina and Unio in strata evidently a prolongation of the Woolwich beds, and by fossil leaves of dicotyledonous trees and layers of lignite in some of those localities. On the other hand at the junction of the "London Clay," and the subjacent "plastic clays and sands," when followed in an opposite or easterly direction towards Herne Bay and the Reculvers, all signs of the freshwater formation disappear, and the pebble-bed is reduced to a thin layer, often a foot or a few inches in thickness. The origin of this shingle may have been chiefly due to the action of waves on a sea-beach. Its accumulation in great force at certain points where freshwater shells abound, seems to imply the entrance of rivers into the sea, which brought down some flints, and arrested the progress of others travelling as beach pebbles along a coast line, in a certain direction determined by the prevailing currents and winds. The spreading of the pebble-bed over a wide area may be accounted for by supposing a gradual subsidence of land, and the continually shifting of the coast-lines upon which shingle accumulated. This same subsidence is required to explain the superposition of the London Clay, a deep-sea deposit to the Blackheath or Woolwich beds which are of shallow water or littoral origin. One of the rivers of the Lower Eocene period swept into the sea at Kyson near Woodbridge in Suffolk the bones of a monkey of the genus Macacus, of a marsupial quadruped allied to the opossum, of a Hyracotherium, and other mammalia, which have been determined by Professor Owen, and which throw light on the inhabitants of the land, at an era antecedent to the deposition of the London Clay.

Sir C. Lyell then exhibited some sections, recently published by Mr. Prestwich,* illustrative of the geology of the environs of London, and gave a rapid sketch of the successive Eocene groups from the London Clay and overlying Bagshot series with its nummulites to the Barton and Hampshire freshwater formations with their fossil quadrupeds. He then alluded to the tertiary strata next in the ascending order which he had recently studied in Limburg, Belgium, which are not represented in England, and next to the Miocene faluns of Touraine and the Pliocene strata or crag of Suffolk, and lastly to the still more modern glacial period and the brick-earth of the valley of the Thames. The last mentioned formation contains the bones of extinct quadrupeds mingled with shells of recent species terrestrial and fluviatile.

The numerous and important changes in the fauna of the globe, attested by these successive assemblages of extinct species, belonging to different tertiary eras, attest the vast lapse of ages, which separate the time when the freshwater beds of Woolwich and Blackheath were formed from the human period. But revolutions of another and no less striking kind have taken place contemporaneously in the physical geography of the northern hemisphere, revolutions on so great a scale that the greater part of the present continents of Europe, Asia, Northern Africa and North America with which the geologist is best acquainted, have come into existence in the interval of time here alluded to. It may also be confidently affirmed that the colossal chain of the Alps is more modern than the tertiary shingle of Blackheath. There was deep sea at the period when the London Clay was forming, precisely in the area where the loftiest mountains of Europe now rise into the regions of perpetual snow. In proof of this the Lecturer referred to the works of several modern geologists, especially to those of Sir Roderick Murchison, and to a Lecture delivered by Sir Roderick in the Royal Institution to show that the nummulitic formation which belongs to the Eocene period, and not to the very oldest part of that period, attains an elevation in some portions of the Swiss Alps of 8,000 or even 10,000 feet, and enters into the structure and composition even of the central axis of the Alps having been subject to the same movements and partaking of the same foldings and contortions as the underlying cretaceous and oolitic strata.

Sir Charles Lyell next proceeded to show that a great series of volcanic eruptions had occurred in Europe since the older Eocene strata of the neighbourhood of London were deposited. Not only Vesuvius and Somma as well as Etna and the extinct volcanoes of Southern Sicily but the trachytic and basaltic eruptions of the extinct volcanoes of central France are more modern than the London Clay. The evidence consists not only of the superposition of igneous rocks several thousand feet thick, to lacustrine strata of the middle

* "Prestwich, Geological Enquiry respecting the Water-bearing strata around London, &c." Van Voorst, 1851.

and upper Eocene periods, but also to the absence in the pebble-beds constituting the base of the tertiary series of Auvergne, Cantal, and Velay of any pebbles of volcanic origin.

The Lecturer concluded by stating that the formation of every mountain chain and every elevation and depression of land bears witness to internal changes at various depths in the earth's crust. The alteration has consisted sometimes of the expansion, and sometimes of the contraction of rock, or of the semi-liquifaction or complete fusion of stony masses and their injection into rents of the fractured crust occasionally manifested by the escape of lava at the surface. Every permanent alteration therefore of level may be regarded as the outward sign of much greater internal revolutions taking place simultaneously far below. Even the precise nature of the changes in the texture of rocks produced by subterranean heat and other plutonic influences since the commencement of the Eocene period can be detected in a few spots especially in the central axis of the Alps where the disturbing agency had been intense. The table might be covered with specimens of gneiss, micaschist and quartz rock, once called primitive, and once supposed to be of a date anterior to the creation of living beings, which nevertheless were sedimentary strata of the Eocene period which assumed their crystalline form after the flints of Blackheath were rolled into shingle, and even after the shells of the London clay and the nummulites of the overlying Bagshot sands were in existence.

Yet however remote may be the antiquity of the Blackheath pebble-bed as demonstrated by the vast amount of subsequent change in physical geography, in the internal structure of the earth's crust and in the revolutions in organic life since experienced, its origin is probably as widely separated from the era of the Chalk as from our own times. For the fossils of the chalk differ as much from those of the oldest tertiary strata near London, as do the last from the organic beings of the present era. Nevertheless the white Chalk itself with its flints is considered by every geologist as the production of a modern era, when contrasted with the long series of antecedent rocks now known, each formed in succession when the globe was inhabited by peculiar assemblages of animals and plants long since extinct.

[C. L.]

In the Library were exhibited : —

Fifty Pebbles from Blackheath and Woolwich, collected by the late Major Boys of Woolwich — Specimens of Gold Quartz, Sulphuret of Mercury from California, and Topaz with Mica, &c. [Exhibited by Mr. Tennant]

Bronze Cast of Napoleon, taken shortly before death — Judge Fraser's Lion-spear — Caffre Instruments of War. [Exhibited by Dr. W. V. Pettigrew, M.R.I. &c.]

Seaward's Patent Brine-valve and Saline Detectors — and specimen

of the Salt deposited on a boiler. [Exhibited by Messrs. Seaward and Capel.]

The "Crouching Venus" of the Vatican, in Alabaster, — Machine Sculpture, by Mr. Cheverton.

A piece of Micacious Iron from Penrice, near Adelaide, New South Wales. [Exhibited by Mr. S. Hall.]

Photographs of Paris, &c. by Capt. R. A. E. Scott, R.N. [Exhibited by Sir Charles Fellows, V. P. R. I.]

Bracelet, — Ruby surrounded by Diamonds. [Exhibited by Madame Ratte.]

Lord Faversham's Prize Ox (in silver). [Exhibited by Messrs. Hunt and Roskell.]

RESIGNATION OF PROFESSOR BRANDE.

April 3rd, 1852.

On the 16th of March Mr. Brande communicated to the Managers his desire to retire from the Chair of Chemistry which he had held since May, 1813. This day he gave his final lecture, at the conclusion of which he addressed his audience in the following words: —

"In this course I have endeavoured to show the intimate relations that subsist between abstract science and the useful arts — between the refinements of modern chemistry and the improved and extended condition of some of our leading manufactures; — and, having brought it to a conclusion, I must take my leave. I may truly say that I unwillingly resign my professorship; but the attacks of hoarseness to which I am subject have of late so much interfered with my duties here, and are so manifestly aggravated by any exertion of voice, as to render the measure one, if not of necessity, at least of prudence.

"In the year 1812, when Sir Humphry Davy retired from office, I was desired by the Managers of this Institution to prepare a probationary course of lectures, which I delivered at this table in 1813, and was immediately after elected to the vacant chair; so that I have been officially attached to the Royal Institution for a period of forty years. During the greater part of that time, namely, from 1815 to 1848, I also delivered a series of lectures and demonstrations on theoretical and practical chemistry in the Laboratory below. They were intended for all denominations of students, and were given thrice weekly, from October to May. They were the first lectures in London in which so extended a view of chemistry, and of its applications, including technical, mineralogical, geological, and medical chemistry, was attempted; and I look back upon them with much satisfaction, because I think I may fairly claim for them the merit of having completed the scheme, and added to the usefulness of this Institution; of having helped to diffuse that knowledge and

love of the science now so general; of having done so amongst all grades and classes of students; of having, therefore, fulfilled one of our principal objects.

"As to the lectures in this theatre, I must not pretend to conceal from you that I relinquish *them* with regret. The teaching of chemistry *here* has always been a delight to me; and to have successfully taught it for so extended a period, and to such an audience, has been, and indeed can be, the privilege of a very few; and believe me, I duly appreciate it, and that I look back with feelings, which I cannot represent in words, at the confidence which the successive Managers of this Institution have placed in me; and at the uninterrupted kindness and attention with which my imperfect endeavours to set forth the truths of chemical science in their varied relations, as evidences of the wisdom, power, and beneficence of the Creator on the one hand, — and, on the other, in their multifarious bearings upon the sister sciences and upon the useful arts, have been received.

"There are also other considerations which necessarily press themselves upon me at the present moment, arising out of a retrospect of the very large portion of my life which has been passed within these walls, and as an officer of this establishment. I rejoice in leaving it, in all respects, more prosperous than at any former period; its scientific fame more pre-eminent; its foundations more secure; its halls more frequented; its usefulness more acknowledged; and I cannot help discerning in this Institution one fertile source of that popularity of science, and extension of schools for scientific instruction, which so peculiarly distinguish the present age, and has more especially manifested itself in this mighty metropolis.

"Looking *personally* at the Royal Institution, I revere it, as my *alma mater*, where as a schoolboy I listened to the fruitful eloquence of Davy, and afterwards partook of his acquaintance and friendship; where I acquired the patronage of Sir Joseph Banks; where I was singled out by Wollaston as his successor in the secretaryship of the Royal Society; where I came into the frequent contact of the chiefs of science, and of literature and art; where Faraday became my pupil, colleague, and friend. These, I assure you, are only a very few of the proud and pleasing reminiscences which accompany me from this place; and they are unsullied and unalloyed; they have never been clouded, tainted, or embittered. I again, therefore, thank you for all your partiality and kindness; and in gratitude to Providence, in whose hands are all the issues of our lives, I respectfully beg you to accept my affectionate farewell."

The Secretary being then called to the Chair, it was moved by Sir Charles Clarke, Bart., seconded by John Pepys, Esq., and carried unanimously, that the thanks of the Meeting be returned to Professor Brande for the great benefits which the Institution had derived from the zeal, ability, and urbanity, with which he had discharged the duties of his office during the long period of thirty-nine years.

GENERAL MONTHLY MEETING,

April 5, 1852.

William Pole, Esq., M.A., F.R.S., Treasurer and Vice-President, in the Chair.

Octavius Brown, Esq.
Rev. James Brownbill.
Abel Jenkins, Esq.
Charles Lyall, Esq.
George Whitlock Nicholl, Esq.
Edward Owen Tudor, Esq.

were *admitted* Members of the Royal Institution.

The Lord Ashburton.
Hon. Augustus Calthorpe.
John Spofforth Dixon, Esq.
William Windham Horner, Esq.
Rev. Cyril Page.
Wyndham Portal, Esq.
Alexander Shaw, Esq.

were duly *elected* Members of the Royal Institution.

The following Report was read : —

RESIGNATION OF PROFESSOR BRANDE.

"*Royal Institution, April* 5, 1852.

"The Managers report: That at their Meeting held on the 16th ult. Professor Brande announced his intention to resign his Professorship of Chemistry in the Royal Institution on account of his health: Whereupon it was Resolved: That the Committee of Managers receive with great regret the communication from Mr. Brande that he feels compelled on account of his health to resign his Professorship of Chemistry, and in accepting his resignation, they wish unanimously to express to him their high sense of the ability, intelligence, and urbanity, with which, during thirty-nine years he has fulfilled the duties of his office; —

"That it was on that day also Resolved: That in further testimony of the high estimation entertained of Mr. Brande's eminent services, he be recommended to the Members of the Institution for Election as Honorary Professor of Chemistry; and that these Resolutions should be communicated to Mr. Brande.

"The Minutes containing these Resolutions having received the confirmation of the Managers at the following Meeting of the Committee held on this day, the Managers report them to the Members; and in so doing they invite the Members to confer on Professor Brande that high distinction which he will most appreciate, and which will be most expressive of their estimation of his services."

On the Motion of Professor Faraday, seconded by Sir John P. Boileau, Bart., and agreed to unanimously, —

W. T. Brande, Esq., F.R.S., L. & E., was put in nomination from the Chair as Honorary Professor of Chemistry in the Royal Institution (in conformity with Chap. XIX. Art. 2. of the Bye-laws).

The Presents received since the last Meeting were laid on the Table and the thanks of the Members ordered to be returned for the same.

From

Anonymous — Fair Play: Political Thoughts addressed to Moderate Men: by one of Themselves. 8vo. 1852.

Bell, Jacob, Esq. (*the Editor*) — The Pharmaceutical Journal for March, 1852. 8vo.

Bowles, Vice-Admiral, (*the Author*) — Thoughts on National Defence; 3rd Edition. 8vo. 1852.

Brande, Professor, F.R.S. — Chemical Gazette, Vol. I. — IX. 8vo. 1842-51.

British Architects, Royal Institute of — Proceedings for March, 1852. 4to.

Editor — The Medical Circular and General Medical Advertiser, Nos. 1 — 6, (and case). 4to. 1852.

Civil Engineers, Institution of — Proceedings for March, 1852. 8vo.
Proceedings, Vol. IX. Part 2. Vol. X. Part 1. 8vo. 1851-2.
List of Members, 1851. 8vo.

Faraday, M. Esq. — Monatsberichte der Königl. Preuss. Akademie zu Berlin, Jan. und Feb. 1852. 8vo.

Franklin Institute, Philadelphia — Journal, Vol. XXIII. No. 1. 8vo. 1852.

Graham George, Esq. (*The Registrar-General*) — Report of the Mortality of Cholera in England, 1848-9. 8vo. 1852.

Hankey, Thomson, jun. Esq. (*Governor of the Bank of England*) — Section of the Well sunk at the Bank of England, 1851.

Holland, Henry, M.D., F.R.S., M.R.I. (*the Author*) — Chapters on Mental Physiology. 8vo. 1852.

Lawrence, Hon. Abbott (*the American Minister, &c.*) — Second Report on Meteorology of the United States, 1843-5. obl. fol. 1850.

London Library, Committee of the — Catalogue of the London Library, Vol. II. 8vo. 1852.

Lovell, E. B., Esq. (*the Editor*) — The Monthly Digest for March, 1852. 8vo.

Moxon, Edward, Esq., M. R. I. — Poetical Works of John Keats, 16mo. 1851.
Life, Letters, and Literary Remains of John Keats, edited by Richard Monckton Milnes. 16mo. 1848.

Nasmyth, James, Esq. — Diagrams of Nasmyth's Patent Steam Hammer and Piledriver.

Prosser, John, Esq. (*Life-Sub. R.I.*) — Views in Syria, Palmyra, Antioch, &c. folio.

Royal Society of London — Proceedings, Vol. VI. Nos. 7 — 10. 8vo. 1852.

Scoffern, John, M.B., F.S.A., (*the Author*) — Projectile Weapons of War and Explosive Compounds. 16mo. 1852.
A Treatise on the Sugar and Sugar Apparatus of the Great Exhibition. 12mo. 1852.

Scrope, G. Powlett, Esq., M.P. (*the Author*) — History of the Manor and Ancient Barony of Castle Combe, Wilts. 4to. 1852.

University of London — London University Calendar, 1852. 12mo.

Wheatstone, Professor C., F.R.S., M.R.I. (*the Author*) — Contributions to the Physiology of Vision, Part II. 4to. 1852.

Wyld, George, M.D., (*the Author*) — The Liver the Regenerator or Hydrogenator in Animals, &c. 8vo. 1852.

WEEKLY EVENING MEETING,

Friday, April 23.

W. Pole, Esq. M.A., F.R.S., Treasurer and Vice-President, in the Chair.

The Rev. Baden Powell, M.A., F.R.S., &c.
SAVILIAN PROFESSOR OF GEOMETRY, OXFORD,

On the Analogies of Light and Heat.

The researches of Sir W. Herschel, Sir J. Leslie, M. De La Roche, and others, long since established the existence of well marked differences in character, not only between the radiation from the Sun and that from terrestrial sources, but even among these latter, according as the source was luminous or not: and this especially as regarded its transmissibility through various screens and the absorptive effect of different surfaces.

But the most striking peculiarity in the radiation from flame was established by Sir W. Herschel and afterwards extended to gas-lights by Mr. Brande, in that even at considerable *distances*, after passing through a *thick glass lens*, without heating it, the concentrated rays produced *heat on a blackened thermometer* at the focus, exactly as in the case of the solar rays.

This pointed to a peculiar distinction (also recognized by Sir J. Leslie) and shewed that *the mere proportion* of heat transmitted by a screen (as in De la Roche's experiments) was not the essential characteristic, but that further distinction as to the *specific nature* of the rays, was wanted. This want it was attempted in some measure to supply in some experiments by the author of this paper, (Phil. Trans. 1825) in which the *character of the different rays as to* transmissibility through screens was examined in combination *with the conditions of the* absorbing surface.

This last is a point even yet little understood; but thus much is clear: —

(1) A certain peculiarity of *texture* in the external lamina is favourable to the absorption of radiant heat, probably in all cases.

(2) *Darkness of colour* is peculiarly favourable to the effect *for the Sun's rays*, and wholly overrules the first condition.

In terrestrial *luminous hot bodies* it does so to an extent sufficient to give very marked indications. But this (as the author shewed, in the experiments referred to), applies to *that portion only* of the compound rays, which is also *transmissible* through glass, the non-transmissible portion is subject wholly to the former condition, as are *all* the rays from *non-luminous* sources (as was shewn by Leslie and others).